Aviation Workforce Development Practices

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Aviation Workforce Development Practices

A Synthesis of Airport Practice

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AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), and the Air Transport Association (ATA) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

The ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

Research problem statements for the ACRP are solicited periodically but may be submitted to the TRB by anyone at any time. It is the responsibility of the AOC to formulate the research program by identifying the highest priority projects and defining funding levels and expected products.

Once selected, each ACRP project is assigned to an expert panel, appointed by the TRB. Panels include experienced practitioners and research specialists; heavy emphasis is placed on including airport professionals, the intended users of the research products. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, ACRP project panels serve voluntarily without compensation.

Primary emphasis is placed on disseminating ACRP results to the intended end-users of the research: airport operating agencies, service providers, and suppliers. The ACRP produces a series of research reports for use by airport operators, local agencies, the FAA, and other interested parties, and industry associations may arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by airport-industry practitioners.

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The **National Academy of Sciences** is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. On the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

The **National Academy of Engineering** was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Charles M. Vest is president of the National Academy of Engineering.

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The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academys p urposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both the Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. Charles M. Vest are chair and vice chair, respectively, of the National Research Council.

The **Transportation Research Board** is one of six major divisions of the National Research Council. The mission of the Transportation Research Board is to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. The Board's varied activities annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation. **www.TRB.org**

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Airport administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the airport industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire airport community, the Airport Cooperative Research Program authorized the Transportation Research Board to undertake a continuing project. This project, ACRP Project 11-03, "Synthesis of Information Related to Airport Practices," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute an ACRP report series, *Synthesis of Airport Practice*.

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

A workforce of trained and skilled professionals is essential to the health and growth of the aviation industry. In addition to the labor needs of the nation's air carriers and air traffic control workforce, thousands of the nation's airports and hundreds of aviation companies are in need of a wide range of talent to perform a wide variety of functions, from fundamental operations tasks to filling higher-level strategic management roles. Local, state, and federal agencies, as well as aviation planning, engineering, and management consulting firms require a workforce that is both technically educated and experienced in the operation of the nation's aviation system. Despite this need, many in the industry are finding it difficult to hire and develop workforce talent with the education and skills to help advance the industry. The purpose of this report is to synthesize information on airport operating entity jobs and related skill sets needed to perform those jobs. This synthesis is intended for managers of airports and other aviation industry organizations that wish to gain insight into the workforce development needs, opportunities, and resources available to the industry, and also identifies opportunities and resources that provide training on the skill sets needed to fulfill airport-related jobs. Gaps between skill sets and educational and advancement opportunities are documented.

Information used in this study was acquired through a review of the literature and survey of airport operators and industry experts.

Seth B. Young, International Aviation Management Group, Inc., Columbus, Ohio, collected and synthesized the information and wrote the report. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

CONTENTS

AVIATION WORKFORCE DEVELOPMENT PRACTICES

SUMMARY

A workforce of trained, skilled professionals is essential to the health and growth of the aviation industry. In addition to the labor needs of the nation's air carriers and air traffic control workforce, thousands of the nation's airports and hundreds of aviation companies are in need of a wide range of talent to perform a wide variety of functions, from fundamental operations tasks to filling higher-level strategic management roles. Furthermore, local, state, and federal agencies, as well as aviation planning, engineering, and management consulting firms require a workforce that is both technically educated and experienced in the operation of the nation's aviation system.

Despite this need, many in the industry are finding it difficult to hire and develop workforce talent with the education and skills to help advance the industry. This difficulty is the motivation for this synthesis study.

The purpose of this synthesis has been to collect information and report on airport operating entity jobs and related skill sets needed to perform those jobs. The synthesis also identifies opportunities and resources that provide training on the skill sets needed to fulfill airport-related jobs. Furthermore, gaps between skill sets and educational and advancement opportunities are documented.

This synthesis is intended for managers of airports and other aviation industry organizations that wish to gain insight into the workforce development needs, opportunities, and resources available to the industry. This synthesis specifically excludes the commercial air carrier industry workforce as well as civil aviation "flight crew" professions (pilots, flight attendants, and dispatchers). In addition, this synthesis does not specifically describe the need for further developing the air traffic management workforce. Rather, this synthesis pays particular attention to the workforce that operates and supports the civil aviation infrastructure, with particular focus on airport and aviation system operations and planning, ground support professions, and technical and management positions found in government entities from the local to the national level.

In addition, this synthesis is intended to supply those institutions that provide workforce development programs with a better understanding of the needs of the industry, so that they may cater their programs to best meet these needs.

The study conducted for this synthesis consisted primarily of a literature-based review of existing workforce development programs, employment statistics from national and local sources, and previous publications covering the subject of workforce development in general. Sources of aviation workforce data included the U.S. Bureau of Labor Statistics, U.S. Bureau of Transportation Statistics, FAA, National Association of State Aviation Officials, and local airport and aviation industry operators.

To supplement this review, communication on the topic of workforce development strategies was conducted with a number of representatives of airports; ground service providers; universities; local, state, and federal governments; and professional organizations. This communication included responses to targeted e-mail queries and follow-up interviews. Approximately 100 airport operators, 30 colleges and universities, and 12 aviation consulting firms

provided input. Airport operators participating in this study covered the spectrum of sizes (large-hub commercial service airports to small general aviation airports) and ownership structures (ranging from small municipally owned airports to airports operated under large multi-airport authorities).

The colleges and universities contacted ranged from community colleges to research universities, with academic degree programs and/or research activities directly applicable to the aviation industry. The consulting firms contacted ranged from small niche aviation practices to multi-national engineering companies with a portion of their practice involving airport- and aviation-related projects.

In addition, a number of representatives from the FAA and aviation professional organizations provided input for this report.

Findings from the study conducted for this synthesis revealed that:

- Workforce development in general is a multi-faceted process designed to create efficient and productive organizations. The process of workforce development begins before the hiring process and continues through succession planning. Furthermore, workforce development is an organizational process, focusing on how teams of individuals, as well as the structure and policies of an organization as a whole, can contribute to overall productivity.
- Workforce development needs in the aviation industry in many ways vary widely among the industry's sectors. For example, some sectors of the industry have primary workforce development interests that focus on fundamental technical training, whereas other sectors have the need to develop the analytical and strategic management skills of their workforce.
- Workforce development practices in the industry currently focus on employee training. Furthermore, most training programs are provided by industry professional organizations, rather than performed in-house. These resources provide training on basic technical skills, as well as offer certification programs in areas relevant to higher levels of management.
- There is limited specific data published about the aviation industry workforce. Much of the workforce data associated with aviation have traditionally focused on the workforce of airline employees, including crew, aircraft maintenance staff, and operational staff. Relatively little census data have been collected on the employment numbers of airport staff, state and federal government aviation agencies, and aviation support service companies. A more comprehensive understanding of the industry workforce may be helpful in creating workforce development programs.
- There are several innovative programs that leverage the resources of both industry organizations and academic institutions to target and meet the workforce development needs of the industry. Such partnerships are intended to achieve the goal of efficiently and effectively developing a productive aviation industry workforce.

CHAPTER ONE

INTRODUCTION

The civil aviation industry is one of the most complex and vital components of the world's economy. It is an industry that requires the talents of a qualified workforce, with skills that run the entire spectrum of professional qualifications, from specialized training and federal certifications, to those general professional and technical skills desired by many other industries. As such, the private- and public-sector organizations that operate as part of the civil aviation industry have unique challenges when developing their workforce. Civil aviation must compete with every other industry for talented professionals, while also ensuring that those that are hired within the industry are properly trained and educated in the knowledge base that is unique to civil aviation.

The economic environment that has existed in recent years up to the date of this report's publication has intensified the challenges to the civil aviation industry. Financial realities of both private- and public-sector organizations within the industry have led to the need to maximize the productivity of the current workforce, as well as to ensure that any new members of the workforce can be productive with as little of a learning curve as practical.

In light of recent economic uncertainties, there remains a growing demand for a well-trained and continuously developing aviation industry workforce. Aviation industry leaders, including the FAA, other federal and state governments, airports, consultants, operators, tenants, and aviation interest groups, are constantly seeking intelligent, trainable, and enthusiastic professionals to meet airport technical, operating, and managerial demands. Airport operators are interested in supporting on-airport businesses in their quest to maintain an adequate workforce through recruitment and retention. Airports are also looking to provide job opportunities in their communities, in part, as a method of increasing support for the airport itself.

As many of the industry's senior experts and key officials are retiring or leaving the industry, there are concerns that aviation professionals are competing to mentor, groom, and hire the same few experienced aviation enthusiasts. Traditionally, an entrant into this industry began at the bottom and had the opportunity to work up to the highest managerial levels of the profession. More recent restructuring of the industry and outsourcing of entry-level functions has diminished the recruitment of qualified candidates within the industry and limited the advancement of entry-level employees. Develop-

ing and applying comprehensive workforce development programs may address these issues.

DEFINING "WORKFORCE DEVELOPMENT"

Much of the literature on the topic of workforce development is found within publications that focus on education, human resources management, and economic development. These sources define the term "workforce development" in a variety of ways. The most basic definition of workforce development equates the term with "employment training," but almost all of the literature expands on this definition (*1*). Workforce development is also associated with employee success, providing not only technical training but also professional education, industry networking, opportunities for advancement, and opportunities to promote the industry, retain the industry's best and brightest, and help foster the future workforce. Workforce development also carries the connotation of a partnership with the industry and outside public- or private-sector professional development or educational organizations. Finally, workforce development implies the building of the workforce as a team, with emphasis on group and organizational workforce development rather than simply the development of an individual's skill set.

Workforce development programs cover four primary areas:

1. Programs for preparation to enter or re-enter the workforce,
2. Learning opportunities to improve workplace performance,
3. Organizational responses to changes that affect workforce effectiveness, and
4. Managing the retention and succession of the workforce.

Above all else, establishing and applying workforce development strategies to address these areas requires knowledge of the fundamental requirements of each job within an organization and how the tasks associated with each job work together to achieve success (*2*). As such, workforce development strategies exist on multiple levels of an organization. These levels are commonly noted as:

- *Systems level:* Focusing on the larger strategic components of workforce development programs.

Systems-level workforce development strategies consider the necessary funding and legislative mechanisms that facilitate the other levels of workforce development. For example, funding policies may include the provision of a workforce development budget.

- *Organizational Level:* Focusing on the workforce development policies of the organization.

Organizational-level workforce development strategies focus on the policies, resources, and supervisory strategies that are geared toward building a workforce that is robust to accommodate changes in the work environment, able to promote internally, and to target hire. Organizational-level workforce strategies may include internal rotation programs, educational seminars, or policies to send members of the workforce to external workforce development opportunities.

- *Team Level:* Focusing on the small group dynamics of a working team.

Team-level workforce development considers a team of individuals performing similar tasks; for example, an airport operations team, or a team of diverse skill sets such as a master planning team. Team-level workforce development on the team level focuses on providing support for team success and developing techniques to improve team communication, coordination, and cohesion.

- *Individual Level:* Focusing on an individual's workforce development.

Individual-level workforce development includes skills training, but also practices to improve employee motivation and reduce stress factors within the working environment. Examples of individual-level workforce development practices include allowing an individual to participate in a training course, applying the skills learned in the training to a project, and providing rewards for successfully performing at this newly achieved skill level. Individual-level workforce development also focuses on employee performance appraisal practices, as it is often the performance appraisal that is the most formal and direct method of communication between employee and supervisor with respect to the employee's workforce development potential. Individual workforce development is also commonly referred to as "professional development."

WORKFORCE DEVELOPMENT IN THE AVIATION INDUSTRY

Workforce development practices in the aviation industry have focused on professional development, while few resources have been dedicated to developing organizational and systems-level workforce development programs. There are a number of reasons for this.

First, before developing organizational- and systems-level workforce development programs it is necessary to have a complete understanding of the current workforce. Interestingly, there is little specific census data with respect to the aviation industry workforce.

In addition, many of the public-sector organizations within the industry, including publicly owned airports, and state and federal agencies, must operate their workforce management practices according to local or federal policies. These policies often do not provide the resources or the operational feasibility for formal workforce development.

As a result, most workforce development programs have focused on professional development. These programs are typically provided by professional agencies supporting the industry or through institutions of higher education. Such programs will be detailed in chapter four of this synthesis.

ORGANIZATION OF REPORT

This synthesis is organized into five chapters. Chapter one introduces the concept of workforce development and, in general, and how, to date, the concept has been applied in the aviation industry. Chapter two focuses on the current state of the civil aviation industry, with respect to the industry's workforce development needs. Within this chapter, a description of the various professions found in the industry is presented, the technical and professional requirements to successfully perform these professions are summarized and described, and the areas where workforce development within the industry is greatest are presented. Chapter three describes the various workforce development resources available to the industry. This chapter describes both in-house training programs and programs available to the industry from external organizations that specialize in aviation system workforce development. In chapter four, innovative workforce development programs and practices are highlighted as examples that may be replicated by other organizations within the industry in meeting their workforce development needs. Chapter five provides the synthesis conclusions with a brief description of further research.

This synthesis also provides an appendix (Appendix A) of institutions that specialize in aviation workforce development. These institutions range from high schools, to colleges and universities, to professional organizations. Appendix B is a list of aviation professional organizations with workforce development resources.

CHAPTER TWO

AVIATION INDUSTRY WORKFORCE

In virtually all professional industries there is a tremendous need for talented individuals to contribute to an organization's mission. Organizations within the civil aviation industry are no different.

One of the great challenges in developing the aviation industry workforce is that the wider professional industry is not generally aware of the multitude of professional opportunities found in aviation. Little research quantifying the numbers and varieties of jobs within aviation has been published, and even the U.S. Bureau of Labor Statistics has focused the majority of its aviation workforce statistics on jobs within the commercial air carrier industry, with an emphasis on aircraft crew (pilots and flight attendants), aircraft maintenance, and customer service (such as ticketing agents and gate agents) positions (3).

Outside of commercial air carriers, the aviation industry includes a wide variety of professions within general aviation, air traffic management, airport operations and management, and aviation system planning and engineering. This synthesis focuses on those segments of the industry that support both commercial air carriers and general aviation, with particular emphasis on the segment of the industry that provides the infrastructure and services to support both commercial service and general aviation operations. These services are most often performed by airports and the ground services companies on, and off, airport property.

According to the National Air Transportation Association (NATA), a member-driven professional services organization representing the aviation industry, more than 2,000 member companies directly serve the aviation industry by providing fuel, on-demand charter, aircraft rental, tie-down and storage, flight training, maintenance, parts sales, baggage handling, line service, and business functions to aviation users (4). Many of the NATA member companies are small businesses using relatively small staffs to provide a wide variety of technical and administrative functions.

According to the National Business Aviation Association (NBAA), a member-driven professional services organization representing corporate and business aviation, more than 8,000 companies employ professionals in aviation-related jobs (5). Many of these companies do not consider business aviation as their core business focus, but have corporate flight departments to aid in the transportation of their workforce.

REGIONAL, STATE, AND FEDERAL GOVERNMENT AVIATION DEPARTMENTS

The FAA itself has a workforce of more than 48,000 professionals located throughout the United States dedicated to the safe operation of the national aviation system. Aside from the thousands of air traffic controllers, the FAA employs the spectrum of professional needs, from inspectors to analysts, in areas ranging from operational safety to capital planning (6). With several geographic regions and operating entities, the FAA is a large government organization with particular workforce development challenges. Although a comprehensive assessment of the FAA's workforce development needs is beyond the scope of this synthesis, it can be noted that many of these needs, as well as the opportunities to meet those challenges, are in many ways similar to those of airports and other areas of the industry.

There is concern within the FAA that the organization will be challenged to find sufficient workforce talent to meet its needs over the next 2 to 10 years. Increasing workloads on the current workforce are being perceived as causing stress and burnout across the workforce.

In addition to the FAA, which employs a federal-level workforce, each of the 50 U.S. states employs aviation experts, often within their state departments of aviation. According to The National Association of State Aviation Officials, approximately 2,700 full-time professionals work for state aviation departments. Individual state aviation departments are often relatively small and as such also have relatively limited resources to dedicate to formal workforce development programs.

As with most other industries the FAA and state aviation departments in particular foresee challenges associated with an aging workforce; ranging from adapting to new technologies and operational paradigms to increased rates of retirement and attrition. Because of limited budgets and an already heavy workload within the workforce, relatively few resources are currently devoted to workforce training and development.

AIRPORTS

The airports element of the civil aviation industry alone accounts for more than 5,000 public-use facilities and nearly 15,000 additional privately owned airfields. Nearly 500 of

these airfields accommodate commercial air carrier service, whereas more than 4,000 public-use facilities routinely accommodate business and corporate aviation. The FAA's National Plan of Integrated Airport Systems (NPIAS) recognizes more than 3,000 civil-use airports in the United States as important components of the nation's aviation and transportation systems (*7*). A 2004 study by Southern Illinois University, Carbondale (*8*) estimated that more than one million people were employed at commercial service airports alone, with nearly 50,000 professionals directly employed by airport sponsors. Airports throughout the United States are considered vital elements of local, regional, and national economies. A talented workforce is continuously needed for these important facilities to thrive.

Airports in the United States operate under a wide variety of public and private agencies. Many smaller municipal airports are managed by a small staff often led by a manager who is also responsible for other municipal functions. Under these circumstances, individuals on staff are required to perform a wide variety of tasks, often with little specialized training in any particular task. Smaller airports are also often highly financially constrained, which limits their ability to formalize any workforce development programs. These smaller airports tend to attract professionals relatively new to the industry and experience relatively high levels of employee attrition as professionals move to larger airports where positions of increasing responsibility and specialized functions are often found.

These larger airports, which often operate as large bureaucracies under a local governmental agency or public authority, tend to require professionals who have specialized expertise in particular airport management functions. Such airports face the challenge of providing professional training to a larger number of employees on a variety of topics. In addition, larger airports confront the challenges of coordinating among organizational departments, particularly when it comes to institutional-level workforce development.

As illustrated in Figure 1, professional positions at the nation's airports vary considerably, from entry-level wage workers to high-level management. Within this wide variety of jobs, special knowledge of aviation and airport operations is needed for successful and safe job performance.

The most fundamental of airport jobs are similar to those jobs found in any private or public agency, and include such jobs as janitorial services, operation of parking toll booths, concession staff (including servers, cooks, and bus staff), and groundskeepers, and frequently have the most basic of requirements, such as the ability to effectively communicate in English and have the proper credentials for employment in the United States.

Operations jobs that have increasing responsibilities and are increasingly sensitive to the safe operation of the airport in turn have increasing requirements. The following jobs often require a high school degree and a driver's license, as well as some specialized skill, often learned at the beginning of employment:

- Landside transportation drivers (e.g., shuttle bus drivers),
- Airside line service staff (fueling, baggage handling, marshalling of aircraft, etc.),
- Clerical staff,
- Facilities maintenance staff, and
- Customer service representative.

Other operational jobs require industry certification in specified areas. These certifications are often earned by attending training courses and completing one or more examinations. Such jobs include:

- Air rescue and firefighting,
- Public safety, and
- Security.

These entry-level jobs typically require less than 1 year of work experience and are considered to be the first jobs that new members of the workforce would be employed without prior work experience.

Jobs that have basic supervisory responsibilities or involve some form of technical analysis tend to require an undergrad-

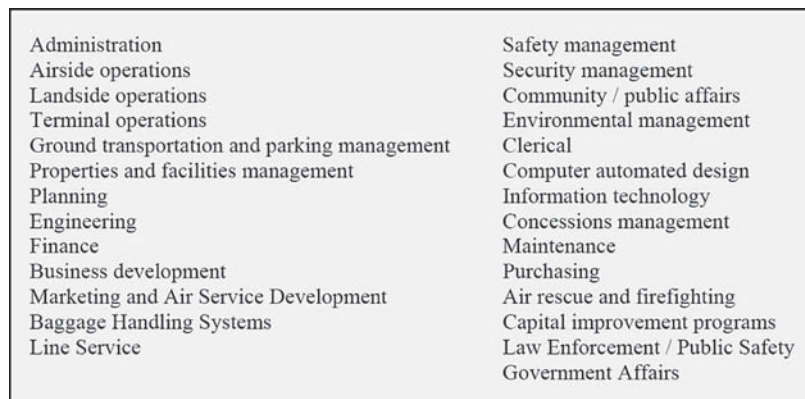|	
Administration	Safety management
Airside operations	Security management
Landside operations	Community / public affairs
Terminal operations	Environmental management
Ground transportation and parking management	Clerical
Properties and facilities management	Computer automated design
Planning	Information technology
Engineering	Concessions management
Finance	Maintenance
Business development	Purchasing
Marketing and Air Service Development	Air rescue and firefighting
Baggage Handling Systems	Capital improvement programs
Line Service	Law Enforcement / Public Safety
	Government Affairs

FIGURE 1 The airport industry is comprised of a wide variety of professional jobs.

uate degree in a specific area and often require 1 to 3 years experience. Such jobs include positions in:

- Airside or landside operations management,
- Planning and engineering, and
- Business administration (marketing, finance, business development).

Middle- and upper-level management jobs at airports involve not only experience and skill in the operation of the airport, but also increasing experience in the management of the organization itself. Requirements for such positions often include at least 5 years of operational experience, with increasing team management responsibilities. Often, either a master's degree or professional certification is highly recommended.

In summary, for entry-level jobs, required skills focus more on technical knowledge, both aviation and non-aviation-based. Such skills include a knowledge of certain aviation regulations, nomenclature, and standard operating procedures; familiarization with certain machinery and tools, in some cases technical writing skills; and familiarization with certain common computer software programs (word processing, spreadsheets, presentation software, database development software, website development, etc.).

As with most professions, fundamental attributes, such as a good work ethic, good written and oral communication skills, and the ability to work within small teams, are also important for entry-level positions.

For management- and executive-level jobs, required skills focus more on administrative experience including project management, personnel management, financial management and budgeting, and interacting with elected officials, the media, and the general public.

A great challenge for organizations within the aviation industry is to be able to develop the abilities of their entry-level employees to the point where they are ready for upper-level management positions.

Airports tend to hire their entry-level workforce in a highly untargeted manner, primarily relying on open position announcements placed in publications ranging from trade magazines, to industry websites, to local newspapers and municipal job boards. This is often because most airports must follow hiring policies prescribed by the municipalities, counties, authorities, or other public agencies under which they operate. These policies include the requirement of public position postings, but often offering preference to employees already within the municipal system and/or military veterans.

An additional challenge is that technical skills and knowledge for much of the industry's entry-level positions are in many instances unique to the industry; therefore, finding professionals with current expertise in these skills can be difficult. As a result, airports must allocate significant resources to technical skills training for their entry-level staff. Furthermore, budget constraints often limit the resources available for this training.

When asked about their most common workforce development challenges, airports participating in this study noted that the entry-level workforce is typically hired with little aviation knowledge or experience. On-the-job training and other succession planning activities are often limited at public-sector organizations such as airports, because most positions cannot be filled until the incumbent, with his/her associated experience, leaves.

It is evident that within the airport and ground services segment of the industry's workforce development issues are concentrated on the need for a more targeted recruiting and hiring strategy, and a need for a more strategic process of grooming their workforce for management and leadership positions.

AVIATION PLANNING, ENGINEERING, AND CONSULTING FIRMS

A large number of private firms and public organizations that focus on the planning, engineering, construction, and financial management of the nation's aviation system support the aviation industry. A significant segment of this industry is comprised of private engineering and consulting firms, ranging from very large multi-national engineering firms to very small businesses or even "one-person shops." Regardless of their size, these firms play a vital role in helping to strategically plan, build, and manage the aviation industry. The other large segment of this industry is found in public entities, ranging from local municipal planning departments to offices within the FAA.

Similar to airports, aviation planning and strategic management organizations require a number of specific technical skills of their workforce, including the ability for management to successfully manage projects, budgets, and staff. As opposed to airports and ground service providers, however, these organizations require a workforce that is more analytical in nature. The ability to construct, evaluate, analyze, and find solutions to given issues is the core requirement of the aviation planner. In addition, the art of forecasting future demand and planning a piece of infrastructure, or an entire aviation system, is a skills requirement that requires constant development and growth.

The Airport Consultant's Council is a member-driven organization representing those firms that focus on aviation and airport management consulting. Nearly 200 such firms are active members of this organization. Council members perform a variety of services to airport management and other aviation industries including those listed in Figure 2.

Each of the services listed in Figure 2 require particular skills. For example, financial planning and analysis requires a

8

Services offered by Airport Consulting Firms
(as reported by member firms of the Airport Consultants Council)
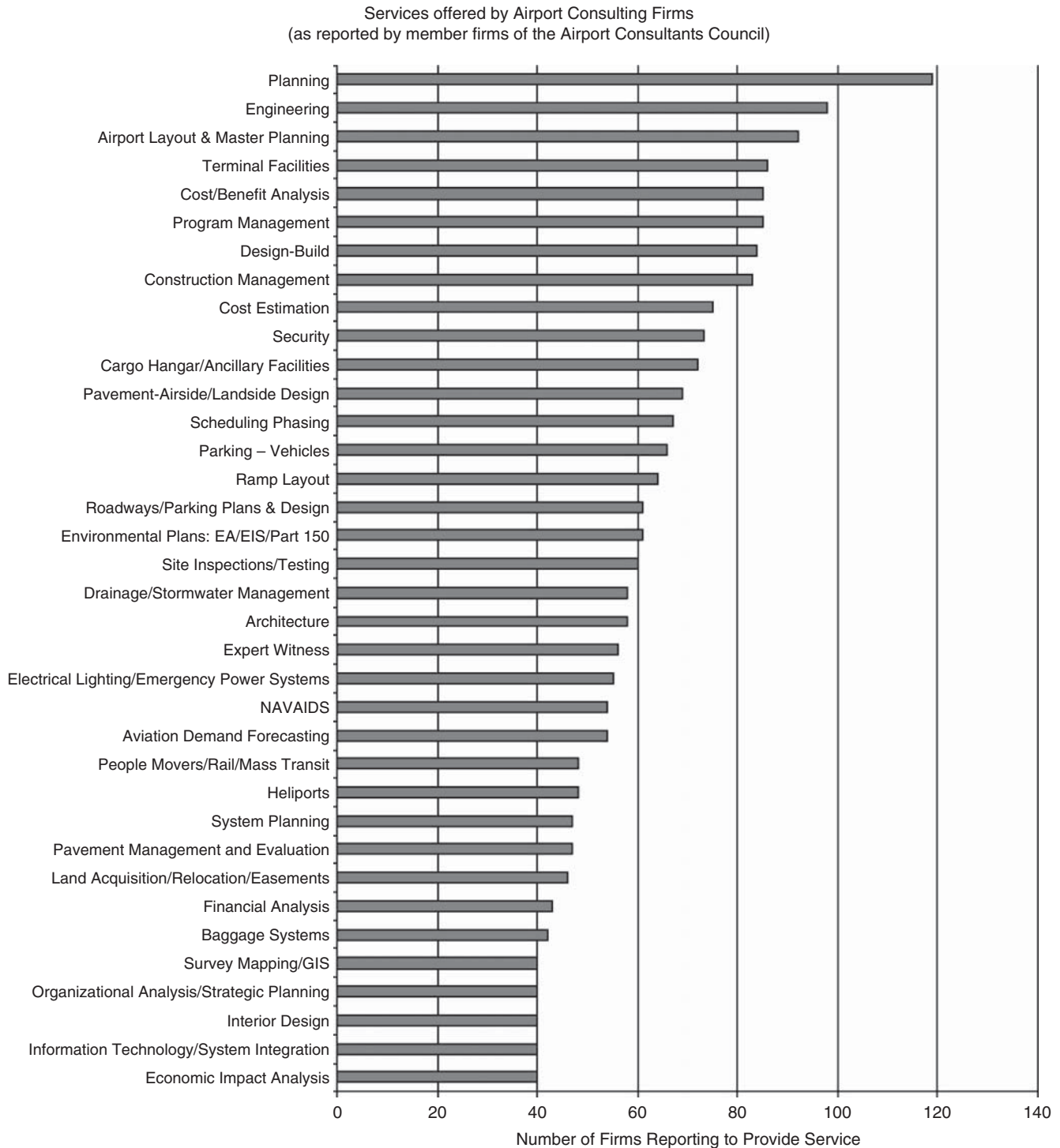
FIGURE 2 Common services provided by airport and aviation consulting firms.

fundamental knowledge of finance and accounting, whereas simulation modeling requires a working knowledge of both theoretical simulation analysis and particular computer simulation modeling software packages. However, the results of the research revealed that common skills are equally if not more important to successfully performing such services. These skills range from communication and presentation skills to project management experience. Figure 3 illustrates the relative importance of these skills. As noted in the figure, oral communication and presentation skills are particularly important for both entry-level and management positions, whereas project management skills are intuitively more important for upper management than for entry-level positions. As shown, specific technical skills are viewed as significantly more important for entry-level workers than for management.
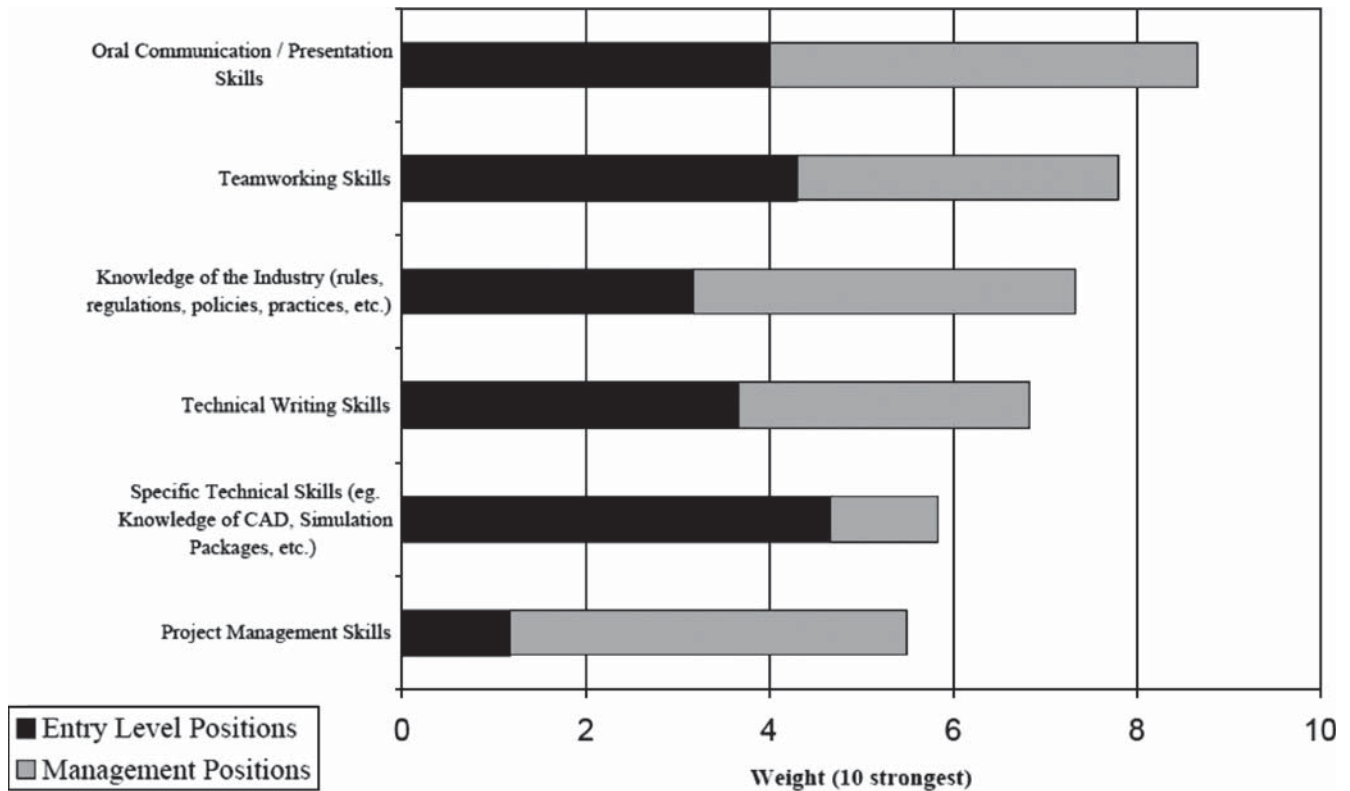
FIGURE 3 Ranked importance of particular workforce skills.

Such results reveal the need for a properly educated and trained entry-level workforce in skills particular to their job activities, whereas management is required to be developed as competent in general administrative skills such as team working and project management.

Other traits important to entry-level positions noted by queried firms included strong analytical and math skills, and general computer skills, as well as qualitative traits such as self-motivation, organizational skills, and a general passion for the work. Additional traits important to management-level positions included client-relationship skills, tact and diplomacy, and the knowledge of the proposal, contract, and procurement processes.

As with airports, planning, engineering, and consulting firms concentrate their efforts on the day-to-day operations of their business, and primarily rely on external programs to develop their existing workforce. The one exception, however, is the emphasis on on-the-job training, where entry-level employees are mentored by senior personnel to prepare them for upcoming levels of responsibility within the company. Such a practice is typical of private-sector firms that have strategic visions for the future of their companies, and less prevalent in public-sector organizations such as airports.

As with airports, consulting firms do send their workforce to industry conferences and workshops to gain current knowledge of industry trends and issues, and invest in industry training and certification programs to allow the workforce to develop particular skills or earn particular accreditations. Private-sector firms also tend to provide a certain level of resources to employees to earn higher education degrees. With the proliferation of on-line degree programs from many accredited universities, the ability for an employee to take courses and earn degrees has become increasingly feasible.

CHAPTER THREE

EXISTING AVIATION WORKFORCE DEVELOPMENT PRACTICES

To meet the workforce development needs of its aviation industry employers, several workforce development practices have been developed using in-house resources, partnering with local educational institutions, or contracting with professional organizations. In addition, academic institutions at the high school, undergraduate, and graduate levels have developed programs to prepare individuals to be successful professionals in the aviation industry. This report focuses on two types of workforce development practices: training of the existing workforce and educating the future workforce.

The workforce development needs for the aviation industry vary by employment level. Entry-level employees require knowledge of technical skills particular to their tasks, whereas management-level employees require more strategic skills common to most managerial positions. To this end, a number of workforce development practices are described here.

Training programs for the existing workforce include:

- Basic skills and communications training programs
- Technical skills training programs
- Business, management, and strategic planning skills
- Executive-level certification.

Education and training programs for the future workforce include:

- Academic degree programs
- Internships and cooperative opportunities
- Attendance and participation in industry professional organization activities.

Integrated programs are:

- Integrated workforce development and academic programs and
- Industrial advisory committees.

There are a number of practices, using internal resources, or external programs developed by professional organizations to train, educate, and otherwise develop the existing workforce at an aviation industry organization.

IN-HOUSE PROGRAMS

For most entry-level employees, a certain level of training is performed internally at aviation organizations in both the public and private sectors. This training is often in the form of basic orientations to the business and introductory, but necessary, skills training.

In private-sector firms, particularly those whose core business is analytical in nature, in-house academic-style seminar forums are often held. Frequently held during lunch hours, but also during retreat-style events, these forums typically involve a member of the organization presenting on a topic of interest (see Figure 4).

To enhance the workforce development experience, firms will often select a certain number of current employees for attendance in rotation programs. Within such programs, employees spend a short amount of time, often between 1 and 3 months, working within a particular sector of the organization, rotating to additional sectors over the course of the entire program, typically 1 to 3 years. Such programs are intended to give employees a more comprehensive perspective on the nature of the organization's business, provide the employee with a more comprehensive skill set, and ultimately contribute to preparing the employee for management-level responsibilities within the organization.

Figure 5 shows that most airports contacted for this study claim to have some kind of formal workforce development programs, whether it be in-house training, outsourced training, or educational programs. General aviation airports are typically less apt to have such programs. Clear in the discussions, however, was the impression that airports equate workforce development with employee training. No airports participating in this study explicitly revealed any other elements of formal workforce development.

Figure 6 illustrates the most common workforce development programs at airports by subject matter. Nearly all of the airports queried and/or interviewed reported providing formal "Security Identification Display Area (SIDA)" training, as required by the FAA for FAR Part 139 certified airports, most of whom perform such training using in-house resources. (Airports serving commercial service air carriers must be compliant with Federal Aviation Regulations Part 139, *Certification of Airports*. Although not actively serving commercial air carriers, many general aviation airports choose to be FAR Part 139 compliant, in whole or in part.) Figure 7 illustrates that many airports have training programs for fundamental airport skills requirements such as airfield operations and driver training, but have fewer
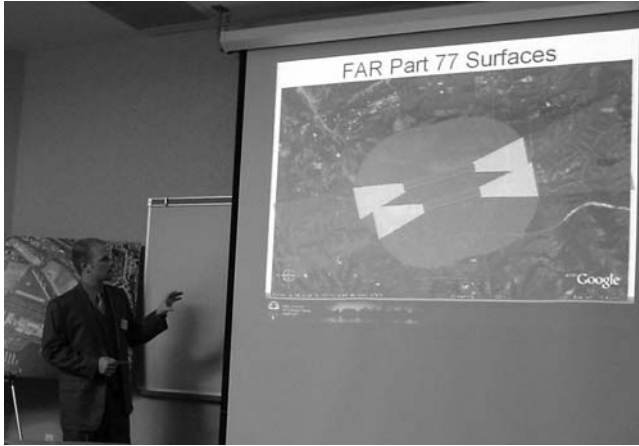
FIGURE 4 In-house seminars provide employees with the opportunity to learn among themselves, and share new ideas, techniques, and thoughts on the future of the industry.

workforce development programs for higher-level administrative and strategic skills such as marketing, finance, engineering, planning, and external relations.

ORGANIZATIONS PROVIDING WORKFORCE DEVELOPMENT RESOURCES

There are a number of professional organizations, research societies, and academic institutions that offer a wide range of workforce development programs, ranging from operational training to management-level training. In addition, these organizations offer the opportunity for workforce development through formal academic education programs, research

forums, participation in industry committees, and networking with other industry professionals.

Participation in any of the following organizations is typically open to any members of the industry. Organizations that provide workforce development programs highlighted in this synthesis include:

- American Association of Airport Executives (AAAE)
- National Air Transport Association (NATA)
- National Business Aviation Association (NBAA)
- International Air Transport Association (IATA)
- TRB
- ACI–NA.

In addition, a number of academic institutions that have focused on educational programs directly relevant to the aviation industry are highlighted.

American Association of Airport Executives

The AAAE claims to be the world's largest provider of interactive training and workforce development programs for the airport industry (*10*). The AAAE has been in existence since 1928 with the mission of supporting the airport industry through representation in Washington, D.C. As part of its membership, the Association has nearly 3,000 airport professionals representing more than 850 civil-use airports. A core function of the AAAE is to provide workforce development programs. The organization does so through a variety of program formats ranging from basic airport familiarization to executive-level management training for current aviation
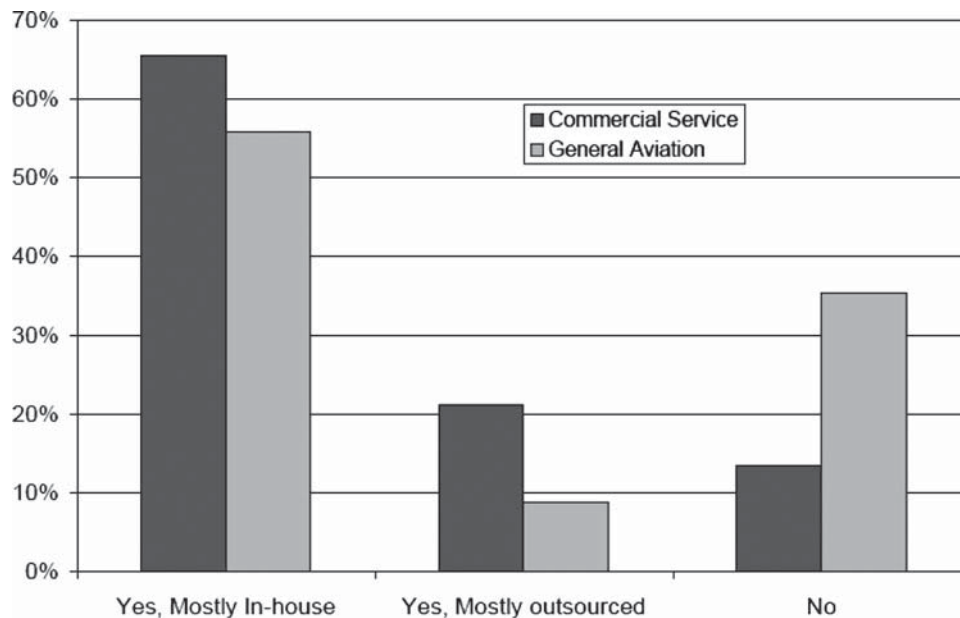
FIGURE 5 Airports with formal workforce development programs.
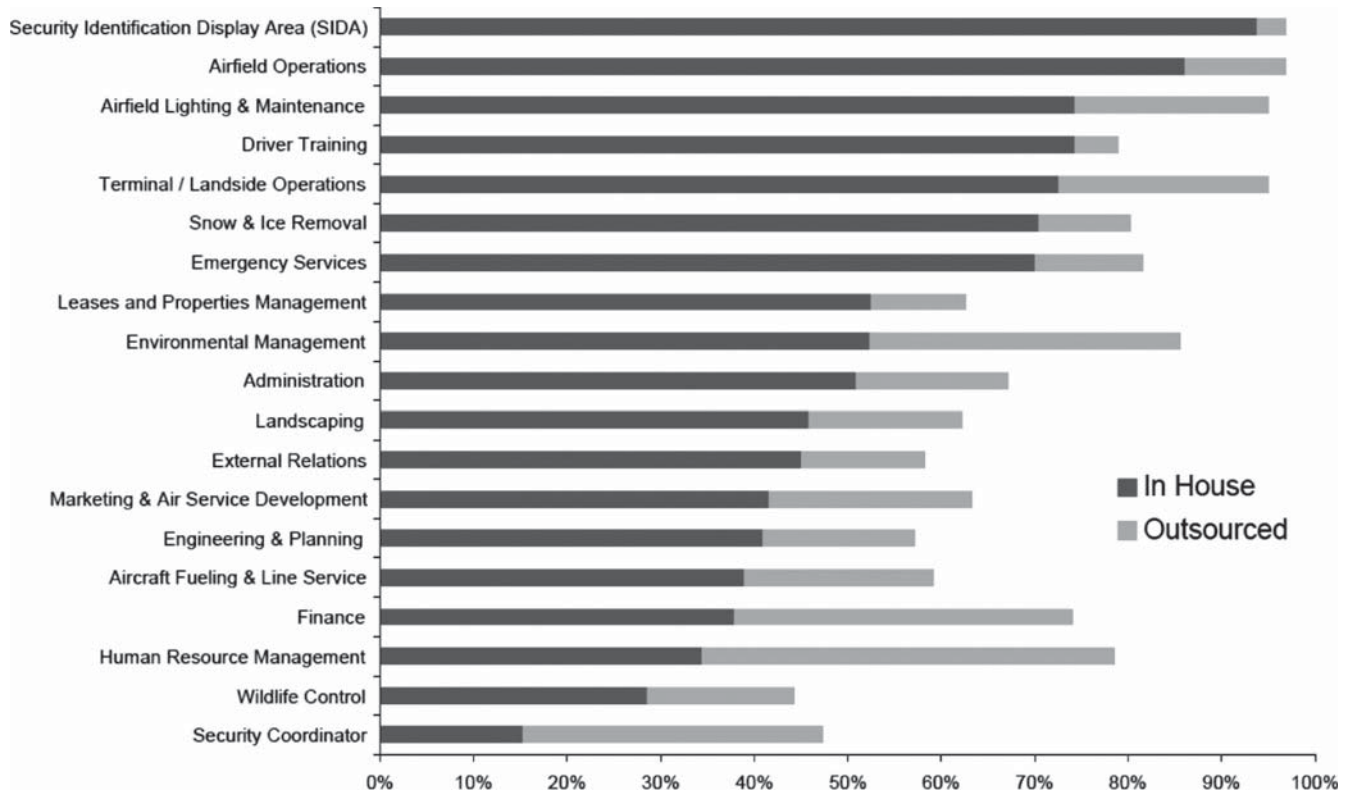
FIGURE 6 Airport workforce development programs by subject (percentage is of those participating in the research for this synthesis).

professionals, as well as educational programs for the future workforce.

Interactive Employee Training

The AAAE Interactive Employee Training Program (IET) is a computer-based series of training programs designed to provide on-site training to airport staff, at their airports of

FIGURE 7 AAAE Academic Relations Committee hosts professional development sessions at annual industry conferences: Internship and Student Employment Programs.

employment. Once installed (hardware and software packages are installed by the AAAE at the airport), the IET is available for use 24 hours a day. Common topics offered include:

- Part 139 compliance
- SIDA training
- Driver training
- Basic airport security awareness
- Customer service
- Runway incursion prevention.

The AAAE will also develop custom programs for airports upon request. All IET program courses are enhanced with custom-created digital video from the specific airport where the program will be installed. The AAAE claims that more than 1.1 million airport and vendor employees have trained on IET systems at more than 82 airports nationwide.

eCISTM

eCISTM (Electronic Computer Instructional System and Training Management) is AAAE's web-based, open architecture learning management system. The system is expandable and able to accommodate additional training courses as needed by the airport or organization. Automated testing, a standard eCISTM feature, ensures employees are mastering the required learning modules.

ANTN Digicast

The ANTN Digicast program is a large collection of web-accessible digital videos covering a wide variety of topics of interest to airports. Digicast emphasizes current events, such as updates to regulations, new technologies, or the latest strategies to manage and operate airports, but also includes a series of videos covering topics fundamental to airports. New videos are added to the Digicast library on a continuing basis.

ANTN Digicast videos may be easily integrated into in-house training programs. The Digicast service has the ability to keep records of the videos viewed by members of the airport's workforce. The ANTN Digicast is available to airports as a subscription service.

On-Site and AAAE Headquarters-Based Training Programs

The AAAE offers on-site or AAAE headquarters-based training programs to airports led by industry-certified experts. These programs typically are comprised of 1- to 5-day workshops, held at the airport, for class enrollments typically ranging from 10 to 50 individuals. Topics have included:

- Accident/Incident Report Writing
- Advanced Airport Safety & Operations Specialist (ASOS) School
- Airport Benchmarking and Performance Measurement
- Airport Business Development
- Airport Certified Employee (ACE)—Airfield Lighting Maintenance
- Airport Certified Employee (ACE)—Communications Program
- Airport Certified Employee (ACE)—Operations Program
- Airport Certified Employee (ACE)—Security Program
- Airport Community/Press Relations for Crisis Management
- Airport Customer Service
- Airport Driver Training & Runway Incursion
- Airport Environmental Management
- Airport Finance
- Airport Ground Transportation and Landside Management
- Airport Liability Insurance & Risk Management
- Airport Management 101
- Airport Marketing
- Airport Pavement Management
- Airport Planning, Design, and Construction Management
- Airport Rates, Charges, and Capital Funding
- Airport Retail/Concessions and Property Management
- Airport Security Coordinator Training School
- Airport Strategic Planning
- Airport Technology Solutions
- Americans with Disabilities Act (ADA) Compliance
- Aviation Security for Law Enforcement Officers
- Basic Airport Safety & Operations Specialist School
- Certified Member Review Course

- Emergency Response and Family Assistance
- Fuel and Hazardous Materials Safety Workshop
- Terminal Operations Efficiency.

AAAE Operations and Management Certification

ACE—Airport Certified Employee Training

The AAAE also offers specialized employee training in four specific areas through its Airport Certified Employee (ACE) training program. This program is designed for full-time employees who require specialized training, over and above typical familiarization training, but not to the level of airport management certification and accreditation. Each ACE program is delivered as a 3- to 5-day course, which may be taken as a self-study course or an on-site course given at the airport. The four disciplines currently offered through the ACE program are:

- *Airfield Operations:* Focusing on FAR Part 139 regulations, airfield familiarization, safety, planning, environmental issues (foreign object debris, wildlife, hazmat, management, etc.).
- *Airfield Lighting Maintenance:* Focusing on airfield electrical systems, lighting requirements, navigational aids, and control systems.
- *Airport Security:* Focusing on TSA regulations, local security procedures, weapons detection, emergency procedures, and international issues.
- *Airport Communications:* Focusing on aviation terminology, communications technologies, dispatching, customer service, public information communications, and stress management.

Accredited Airport Executive (AAE) and Certified Member (CM) Programs

The AAAE's accredited airport executive program is widely accepted in the industry as one of the standard programs for developing executive-level airport professionals. Completion of this program requires passing comprehensive written and oral examinations, writing a research paper on a topic of interest to airports, and requires at least three years professional experience at an airport. Although this program is primarily an individual self-study program, the AAAE offers a published "Body of Knowledge" and "Accreditation Study Guide" to aid program participants with their studies. The AAAE also has a staff to help participants develop research for their written reports and has an active mentor program pairing already accredited professionals with those in the program.

In addition, a number of regional chapters of the AAAE hold a week-long "study course" to help prepare those in the program for the Body of Knowledge written exam. These "AAAE Accreditation/Certification Academies" are typically offered twice a year.

The Body of Knowledge includes the following topics:

- History, the Regulation of Air Transportation, Airports, and the FAA
- The Management Functions
- Management Theories, Roles, Motivation, and Communication
- Airport Capacity and Delay
- Air Traffic Control, Airspace, and Navigational Aids
- Environmental Regulations
- Airport Noise and Land Use Compatibility
- Financial Management and Accounting
- Airport Fees, Rates, & Charges
- Capital Development and Funding for Airports
- Airport System Planning and Airport Master Planning
- Airport Layout Plans
- Terminal Planning, Design, and Operation
- Airport Operations and FAR Part 139—Certification
- Airport Security and Response to Emergencies.

Those who either do not have the required amount of airport experience or simply wish not to pursue full accreditation with the AAAE have the opportunity to develop their airport management knowledge by earning AAAE Certified Member status. Achieving CM certification is done by successfully passing the AAE Body of Knowledge written exam.

The airport management industry widely recognizes AAE or CM certification as highly recommended or required representations of sufficient airport management knowledge and experience. Often, positions of upper management at airports will require such certification for hiring. As such, many airports provide resources, mostly in the form of allocated time, to employees wishing to pursue these certifications

AAAE Conferences and Meetings

AAAE offers educational opportunities through a wide selection of conference-style meetings are available throughout the country on a variety of topics. Speakers at these conferences are typically other airport professionals who have had recent experiences and industry consultants with particular expertise in certain topics of interest. Examples of recent meeting topics include:

- Aircraft and Airfield Deicing and Stormwater Issues
- Basic Airport Safety and Operations Safety Specialist School
- Disadvantaged Business Enterprises
- Airfield Construction Management Workshop
- Airport Pavement Maintenance and Evaluation Workshop
- Essentials of Airport Business Management Workshop
- Airport Geographic Information Systems Workshop
- Accident and Incident Investigation Workshop
- Airports Energy Efficiency Forum
- Airport Parking and Landside Management Workshop.

Attendance at these conferences typically requires fees for conference registration, as well as travel and lodging expenses.

Regional chapters of the AAAE also often hold short courses in various areas of airport management. For example, the Southwest Chapter of the AAAE (SWAAAE) holds an annual Airport Management Short Course. This course is structured to cover topics of current importance to airport management, in recent years covering topics ranging from energy management, to human resource management issues. National and regional workshops and short courses offered by the AAAE and their regional affiliates may be found at the AAAE website (http://www.aaae.org).

Committee Participation

The AAAE also has a number of standing committees that focus on a number of topics of importance to the industry. Participation by professionals in the industry who are dues paying members of the AAAE on these committees is welcomed. These committees offer opportunities to address the latest upcoming issues in their particular areas of interest. Participation on these committees also includes networking with other professionals in these particular areas. AAAE standing committees include:

- Airline Economics and Air Service
- Airport Training
- Environmental Services
- General Aviation
- Military Relations
- Operations, Safety, and Planning
- Transportation Security
- Academic Relations.

AAAE Academic Relations Activities

The AAAE's Academic Relations Committee in particular is active in workforce development, particularly working with academic institutions and the aviation industry.

Members of the committee include airport executives and academic faculty. The purpose of the committee is to develop programs that provide airport management access to university students, as well as encourage students to become involved in learning more about the airport management industry.

The committee hosts sessions at annual AAAE meetings for current university students and recent graduates seeking to learn more about the airport management industry and network with current airport management professionals. Session topics have included Professional Networking and Professional Behavior, the basics for entering the airport management profession.

AAAE University Student Chapters

The AAAE supports a number of student chapters at several of the nation's colleges and universities. These chapters are made up of graduate and undergraduate students with an interest in a career in airport management or related field. Networking with these chapters provides one of the best first steps for developing the future workforce. Internship programs, student projects, and other educational opportunities are often coordinated through these chapters (see Figure 8). A list of student chapters may be found by contacting the AAAE.

National Air Transportation Association

NATA is an aviation industry professional organization whose mission is to be the leading national trade association representing the business interests of general aviation service companies. NATA serves its member companies by providing education services, as well as other benefits with the goal of helping to ensure their long-term economic success (*11*).

NATA Professional Line Service Training

Through its "Safety 1st Program," NATA offers a Professional Line Service Training (PLST) program (*12*). The PLST program is designed to train, both initially and recurrently, professionals who perform duties on the airport ramp, including such skilled tasks as fueling, marshalling, and aircraft line servicing, of general aviation and commercial aircraft.

PLST provides state-of-the-art initial and recurrent training for line service specialists, meets 14 CFR Part 139 Section 321 fire training requirements, is continuously updated and expanded, and includes aircraft-specific information.

PLST is available anytime, anywhere, and is up-to-date with the latest best practices and industry standards, with interactive lessons and electronic reporting of student progress. Additional checklists and reference materials are included in the program.

FIGURE 8 AAAE student chapters are excellent resources for developing the future aviation workforce.

PLST is available for a nominal annual subscription fee and per student enrollment.

PLST topics include:

- Introduction to Ground Servicing
- Safety
- Fuel Servicing
- Towing Procedures
- Fuel Farm Management
- Customer Service
- Fire Safety
- Aviation Security.

The PLST program is offered on-line using any Internet-connected computer.

More than 900 aviation-related companies, including fixed-base operators (FBOs) and airports have used PLST to train thousands of line service specialists across the world. The NATA PLST program may be found at the NATA Internet website at http://www.nata.aero/plst/.

National Business Aviation Association

The NBAA claims to be the leading professional organization for companies that rely on general aviation aircraft to help make their businesses more efficient, productive, and successful. The NBAA represents more than 8,000 companies with interests in business/corporate aviation (*5*). These companies range from aircraft manufacturers, to fuel service providers, to owners and operators of airports that accommodate business aviation activities.

The NBAA has a number of professional development programs focused on advancing the careers of those in the business and corporate aviation industry.

NBAA Professional Development Program

According to the NBAA, the organization's Professional Development Program (PDP) is designed to "help individuals with the Association's Member Companies" advance their careers by preparing business aviation professionals for management roles. The PDP is a series of course curricula, delivered either by the NBAA at select locations or through PDP eligible courses at a variety of colleges and private organizations. Course materials are delivered in print and digital format. Since its inception in 1998, more than 5,000 person-courses have been completed.

NBAA's PDP is divided into five specialized areas: Business Management, Leadership, Operations, Personnel Management, and Technical and Facilities Services. Typical courses are 2 to 3 days in length.

NBAA Certified Aviation Manager Program

Similar to AAAE's CM program, NBAA's Certified Aviation Manager (CAM) program provides the opportunity for member individuals to be officially recognized as being highly proficient in five subject areas: Business Management, Leadership, Operations, Personnel Management, and Technical and Facilities Services. Members who have completed a certain number of PDP courses, or have sufficient levels of education, professional licenses, or participation at industry events such as conferences or workshops, are eligible to take a written exam. Achieving a certain score on the exam earns the applicant CAM certification.

On-Demand Education

NBAA's On-Demand Education Program provides computer-based educational programs covering a variety of topics, ranging from safety to finance. Many of the courses in the program are offered free by the NBAA, whereas others may be purchased on a one-time-use or recurrent-access basis. More information on the NBAA and its professional development programs may be found at the NBAA website: http://www.nbaa.org.

International Air Transport Association

The International Air Transport Association (IATA) is one of the world's leading professional organizations representing the commercial air carrier industry. More than 230 airlines, representing more than 90% of the world's scheduled international air traffic comprise the membership of IATA (*13*). In addition to commercial air carriers, a number of airports are members of IATA as well.

IATA Training Programs

IATA supports the IATA Training and Development Institute, one of the leading providers of global aviation training solutions and professional development programs. The Institute offers courses on more than 200 topics of interest to management-level professionals in the aviation industry. Although many of the courses focus on topics of direct relevance to airline management, a good number of courses are directly relevant to airport management and aviation support industry. Examples of such courses include:

- Airport Certification and Standards
- Airport Customer Service
- Airport Emergency Planning and Management
- Airport Financial Management
- Airport Marketing
- Airport Master Planning
- Airport Operations
- Airport Safety Management Systems
- Airport Security Operations

- Airport Strategic Management
- Airport Terminal Design and Planning
- Aviation Law
- Basic Airside Safety
- Business Continuity Planning
- Cost Reduction Strategies
- Foundations of Airport Commercial Management
- Human Resources Management
- Leadership Development and Succession Planning
- Network, Fleet, and Schedule Planning
- Revenue Management
- Understanding Air Traffic Control.

In addition to taking courses on a stand-alone basis, IATA offers programs of courses that can lead to an IATA diploma. IATA diplomas of relevance to the airport and aviation support industry include:

- Advanced Airport Operations
- Airport Strategic Management
- Civil Aviation Management
- People Management
- Project Management
- Safety Management.

IATA training centers are located worldwide, with a U.S. training center in Miami, Florida. In addition, on-site training programs may be arranged for groups of individuals at a particular airport or aviation business. Finally, many of the courses have been developed as self-study courses, leveraging information technology to facilitate information transfer and communication with instructors and fellow students. More information on IATA training programs may be found at the IATA website: http://www.iata.org/training/.

National Academies' Transportation Research Board

One of the major divisions of the National Research Council, TRB promotes innovation and progress in transportation through research. TRB's Aviation Group focuses on issues important to the nation's aviation system (*14*). The Aviation Group is comprised of nine standing committees.

TRB Aviation Committees

The Aviation Group is comprised of nine standing committees:

- Intergovernmental Relations
- Aviation System Planning
- Environmental Impacts
- Aviation Economics and Forecasting
- Airport Terminals and Ground Access
- Airfield and Airspace Capacity and Delay
- Aircraft/Airport Compatibility
- Light Commercial and General Aviation
- Aviation Security and Emergency Management.

Committees enjoy participation from a wide variety of practice areas in industry, academia, consulting and airport operations, and are recognized as a worthwhile means of professional and technical development.

ACRP Panels

TRB supports ACRP. ACRP carries out applied research projects on a wide spectrum of topics of importance to the nation's airports. TRB encourages participation in ACRP, in part, by joining advisory panels, submitting problem statements, and submitting proposals to perform research. Many of the projects in this program involve creating guidebooks that provide fundamental information on topics. Participation in this program has proven itself to be an excellent educational and workforce development experience. One can learn more about the ACRP at http://www.trb.org/acrp.

TRB Annual Meetings, Symposia, and Workshops

The TRB annual meeting, held each January in Washington, D.C., brings nearly 10,000 professionals together to discuss the latest issues affecting the world's transportation systems. A portion of this meeting is dedicated to aviation issues. Often, more than 50 sessions are scheduled to discuss a wide variety of aviation-related issues. These sessions have been known to be very valuable for senior aviation professionals as well as junior staff and students to learn from each other on topics covering both the theory and practice of aviation management. TRB, through its standing committees, also routinely holds symposia, webinars, and workshops focusing on aviation issues (see Figure 9). More information on TRB may be found at http://www.trb.org.

Airports Council International–North America

ACI is a professional association representing the world's airports, whose mission is to advance the interests of airports and to promote professional excellence in airport manage-

FIGURE 9 Attending conferences, symposia, short courses, and workshops is an excellent way to learn from others in the industry.

ment and operations. ACI–NA is the largest of five worldwide regions of the ACI (*15*).

ACI–ICAO Airport Management Professional Accreditation Program

Launched in 2007, the ACI–ICAO (International Civil Aviation Organization Professional Accreditation) Airport Management Professional Accreditation Program (AMPAP) proclaims to be the only global professional accreditation for airport personnel. The program consists of six courses taken over a 3-year period. Completion of the program earns the graduate an International Airport Professional (IAP) accreditation.

To complete the AMPAP program, one must finish four mandatory courses and two electives. The four mandatory courses are:

- The Air Transportation System
- Airport Planning, Development, and Environmental Management
- Airport Commercial and Financial Management
- Airport Operations, Safety, and Security.

Courses are delivered by means of classroom and on-line formats.

Electives include:

- Airline Management for Airport Professionals
- Airport Communications and Public Relations
- Airport Environment Management
- Airport Executive Leadership Program
- Airport Facilities Management
- Airport Human Resources Management
- Airport User Charges
- Aviation Security Professional Management
- Developing Customer Service Culture at Airports: Measuring and Benchmarking the Results
- Safety Management Systems
- Strategic Use of Information Technology.

More information on the ACI–ICAO AMPAP can be found at http://www.iap.aero.

ACI–NA Conferences

ACI–NA also hosts approximately 20 conferences and seminars annually, covering topics ranging from insurance and risk management to international aviation issues (see http://www.aci-na.aero). Recent conference topics have included:

- Airport Concessions Management
- International Aviation Issues
- Airport Planning
- National Environmental Policy Act Practitioners Workshop
- Economics and Finance
- Safety and Security.

Other educational opportunities also exist within the FAA itself, including regional conferences and technical symposia. Such opportunities also may exist within individual state-level aviation organizations. For example, the Florida Airports Council has created a seminar series covering various topics of importance to airports within the state. These seminars are digitally archived and available for distribution through the Council.

Other aviation organizations not directly focused on the airport management and aviation industry workforce outside of flight crew, aircraft maintenance, and air traffic control hold organizational events that may be of benefit to educating the workforce. Such organizations include the Aircraft Owners and Pilot's Association, the Experimental Aviation Association, and Women in Aviation.

**Institutions of Higher Education—
University Short Courses**

A number of universities in the United States host week-long short courses on topics associated with the strategic management and planning of airports and aviation systems. Following are three examples:

*University of California at Berkeley Airport
Systems Planning and Design Short Course*

The University of California at Berkeley hosts an annual Airport Systems Planning and Design short course. Often held in November in Berkeley, California, the four-day course covers topics such as airport systems planning, airport master planning, air traffic demand forecasting, airfield layout planning and design, landside modeling, airspace and airport capacity, airline operations and economics, airport finance, and environmental planning and land use compatibility training. This course is often attended by employees of airports, and government, and private consulting firms who wish to learn the fundamentals of these topics, as well as to gain insight into the most recent techniques and strategies for addressing the issues facing today's airport system. More information about the Berkeley Airport Systems Planning and Design short course may be found at http://www.its.berkeley.edu/nextor/airportcourse.

*University of Texas Airport Engineering
and Management Short Course*

The Center for Lifelong Engineering Education at the University of Texas at Austin hosts an annual three-day short course in Airport Engineering and Management. This course focuses on the engineering-level details of airport management. Topics covered include the FAA/ICAO planning process, airport pavement design and rehabilitation, airport capacity analysis, airport security, and airfield signing and lighting systems. More information about the University of Texas Airport Engineering and Management short course may be found

at http://lifelong.engr.utexas.edu/shortcourse.cfm?course_num=1210.

Cranfield University, United Kingdom

The Cranfield University Department of Air Transport offers a suite of short courses covering a wide variety of topics associated with managing airports. One-week courses are offered in airport operations, airport strategic planning and the environment, airport business management, airport commercial revenue development, and airport design.

More information about the Cranfield University curriculum of airport management short courses may be found at http://www.sovereign-publications.com/cranfield-air-transport.htm.

Academic Degree Programs

Most of the more than 4,000 community colleges, four-year undergraduate colleges, and research universities in the United States offer courses and academic programs of relevance to developing the aviation workforce. Many of these courses and programs are fundamental in nature, offering education in disciplines ranging from business administration to engineering. Many local businesses, including aviation companies, local airports, and air service providers often hire from their local colleges, with the understanding that academic degrees are often the foundation of professional success.

In addition, many such entities have found that an active working relationship with a local or national educational institution is beneficial to an aviation industry firm's workforce development needs.

Although most institutions offer education not specific to the aviation industry, many do offer at least a small number of courses associated with aviation. These courses are typically an introductory or survey course of issues in aviation; typical course titles such as Introduction to Aviation, Airline Operations and Management, and Airport Operations and Management are found to be the most common of such courses. In addition, if the institution offers flight training, academic courses associated with airfield familiarization, air traffic control, and federal regulations are often offered. These courses do offer educational benefits for those in the aviation workforce that are not flight crews.

*University Aviation Association Member
and Aviation Accreditation Board
International Accredited Universities*

Approximately 100 institutions of higher education are institutional members of the University Aviation Association (UAA) (*16*). The UAA is a non-profit member-driven organization

whose mission is to promote and foster excellence in collegiate aviation by providing a forum for students, faculty, staff, and practitioners to share ideas, enhance the quality of education, and develop stronger aviation programs and curricula.

The UAA addresses its mission, in part, by hosting conferences and educational workshops for its members, as well as by working with the wider aviation industry to meet its workforce needs.

UAA institutional members are typically four-year colleges and universities that offer degree programs in the aviation field. Many UAA universities focus entirely on flight training, whereas others provide broader aviation-related curricula, from air traffic control to airport management. Aviation courses are typically housed in a university's college or department of technology, engineering, business, or "aviation."

Degree Programs

Aviation programs at UAA schools are primarily offered at the undergraduate level (Associates and Bachelors degrees), although a select number of UAA schools offer Masters and Doctorate-level programs, as illustrated in Figure 10 (*17*).

Figure 11 illustrates the number of reported enrollments in each degree program at UAA member institutions

Known as the Council on Aviation Accreditation until 2005, the Aviation Accreditation Board International (AABI) has the mission of advancing quality in education through a formal accreditation program and providing guidance to educational institutions delivering aviation-related education. According to the AABI, accreditation ensures that professional programs achieve and maintain a level of performance as judged by the FAA, other educational programs, and the wider aviation industry (*18*).

Thirty programs at four-year colleges and universities, located throughout the continental United States, are currently accredited under AABI. Engaging in relationships with these programs is one such strategy to target the development of a future workforce. A list of UAA institutional members is provided in Appendix A of this report.

Most such schools offer fully accredited degree programs in Aviation Management. These programs are typically broadbased curricula offering overviews of the different elements of the aviation industry. Fewer such institutions offer full degree programs in specialized areas within aviation, such as Aviation Safety, Aviation Security, and Airport Management; however, most schools do offer at least one course in these areas.

These institutions also tend to offer more fundamental courses with applications to aviation, including full-degree programs or majors in areas ranging from Economics and Finance to several relevant engineering disciplines.

Figure 12 illustrates the emphasis of certain course topics at UAA member schools. From this figure it can be seen, for example, that 90% of UAA schools offer either a full degree program or a major in Aviation Management, and most offer at least basic Business Administration courses, while fewer schools offer majors or individual specialized courses.

Several of these schools reported engaging in activities outside of traditional course curricula to help develop and educate students interested in aviation careers (see Figure 13). The most common such activities include:

- *Extracurricular organizations*
  Organizations such as the Alpha Eta Rho aviation fraternity or a student chapter of the AAAE provide opportunities for students to further their education outside of the classroom. Often these organizations make site visits
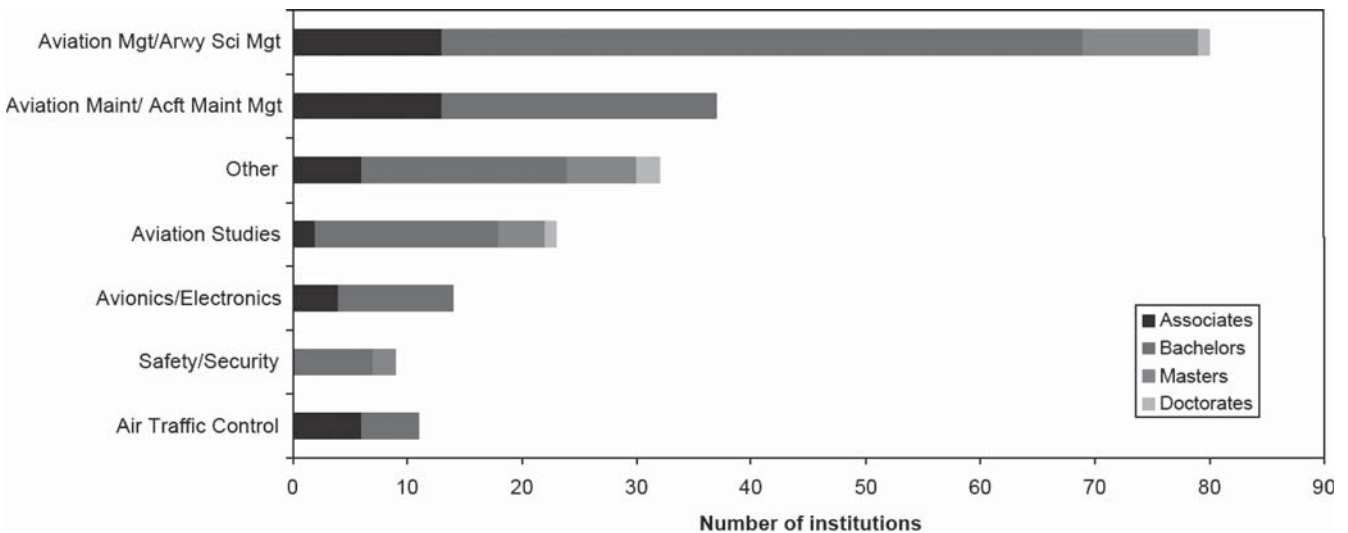

FIGURE 10 Aviation programs offered at UAA member institutions.
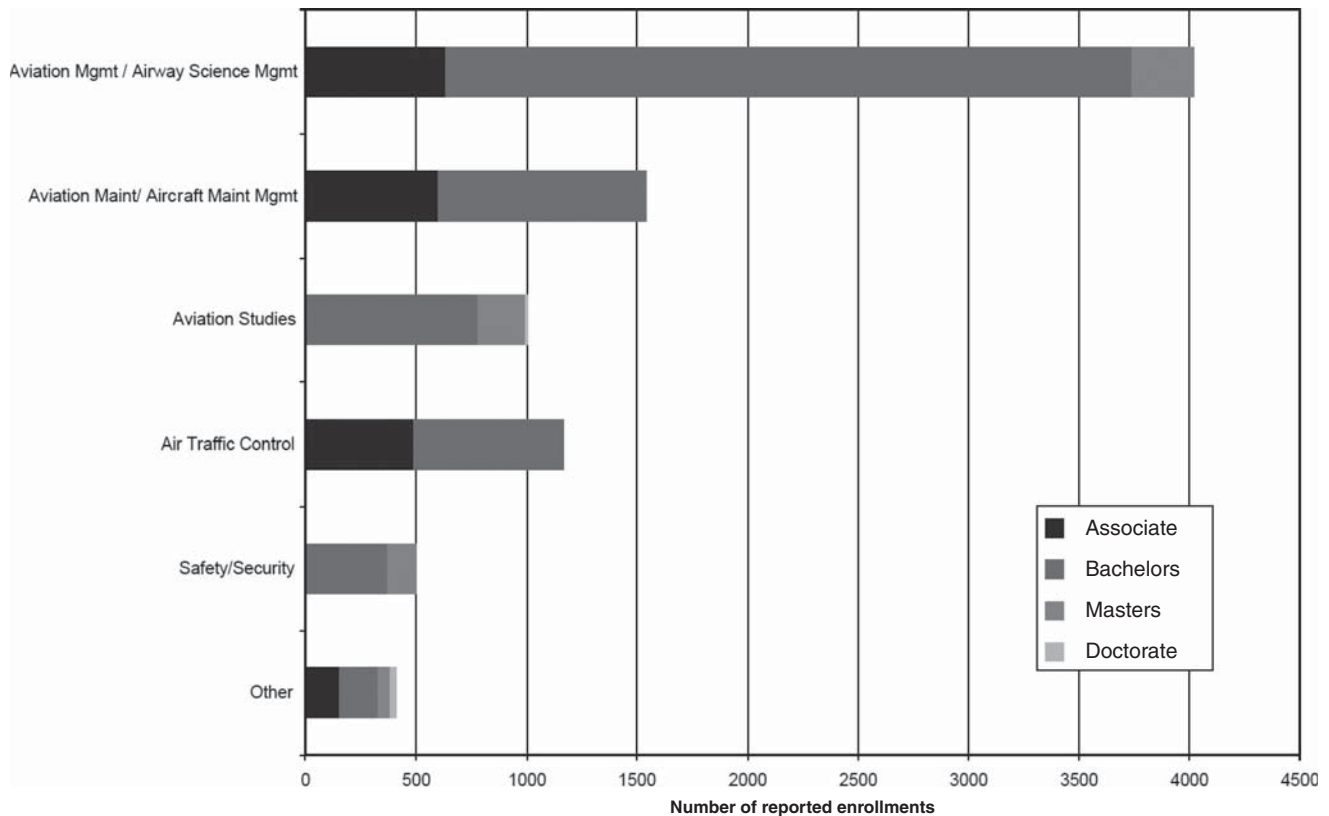
FIGURE 11 Program enrollments at UAA member institutions.

of aviation companies, perform volunteer work for such companies, and attend larger industry conferences. These activities allow the future workforce to target their interests, network with current professionals, and develop relationships of mutual benefit to future employers and their careers.

• *Guest Speaker and Mentoring Opportunities*
Many of these schools host regular guest speakers and seminars to discuss current issues in the aviation industry. Many of the speakers are local professionals within the aviation industry, such as airport managers, FBO operators, or local flight department managers. These events not only provide the opportunity for the future workforce to target their learning and focus on given interests, but also give those who are present an opportunity to stress what they believe are the more important issues affecting the industry, as well as help target their potential future employees. These events also provide the opportunity to create mentorship programs between the current and future aviation workforce.

• *Student Employment Activities*
Many of these institutions also operate flight programs or other aviation-related activities including operating their own airports or FBOs. Quite often, many employment positions are filled by current students. Student employment positions range from line service, fueling, and other airfield ramp activities to administrative staff positions. It is clear that these activities give the student employees valuable work experience, which will make them more productive when they enter the workforce as career professionals.

• *Research Opportunities Benefiting Workforce Growth and Development*
Many colleges and universities, including but not limited to those schools with aviation programs, actively engage in research that addresses the needs of the aviation industry, works directly with industry participants, and utilizes both the current and future workforce. Many strategic issues can be addressed by coordinating with these schools.

• *Scholarship Programs*
Most universities offer financial aid and scholarship opportunities for full- and part-time students in degree programs. There are also a number of scholarship opportunities available, particularly for those studying aviation or an aviation-related discipline. The UAA publishes an annual catalog of scholarship opportunities.

According to the UAA, as of 2009, there are more than 750 scholarships available, totaling more than $1.2 million. Nearly 20 of these scholarships, totaling $12,500 in award funding are specifically for those pursuing studies in airport management. Another 70 scholarships totaling nearly $200,000 are available to those studying in the field of aviation management (*19*).

Some institutions, not necessarily affiliated with UAA, have aviation programs or have worked with local air-
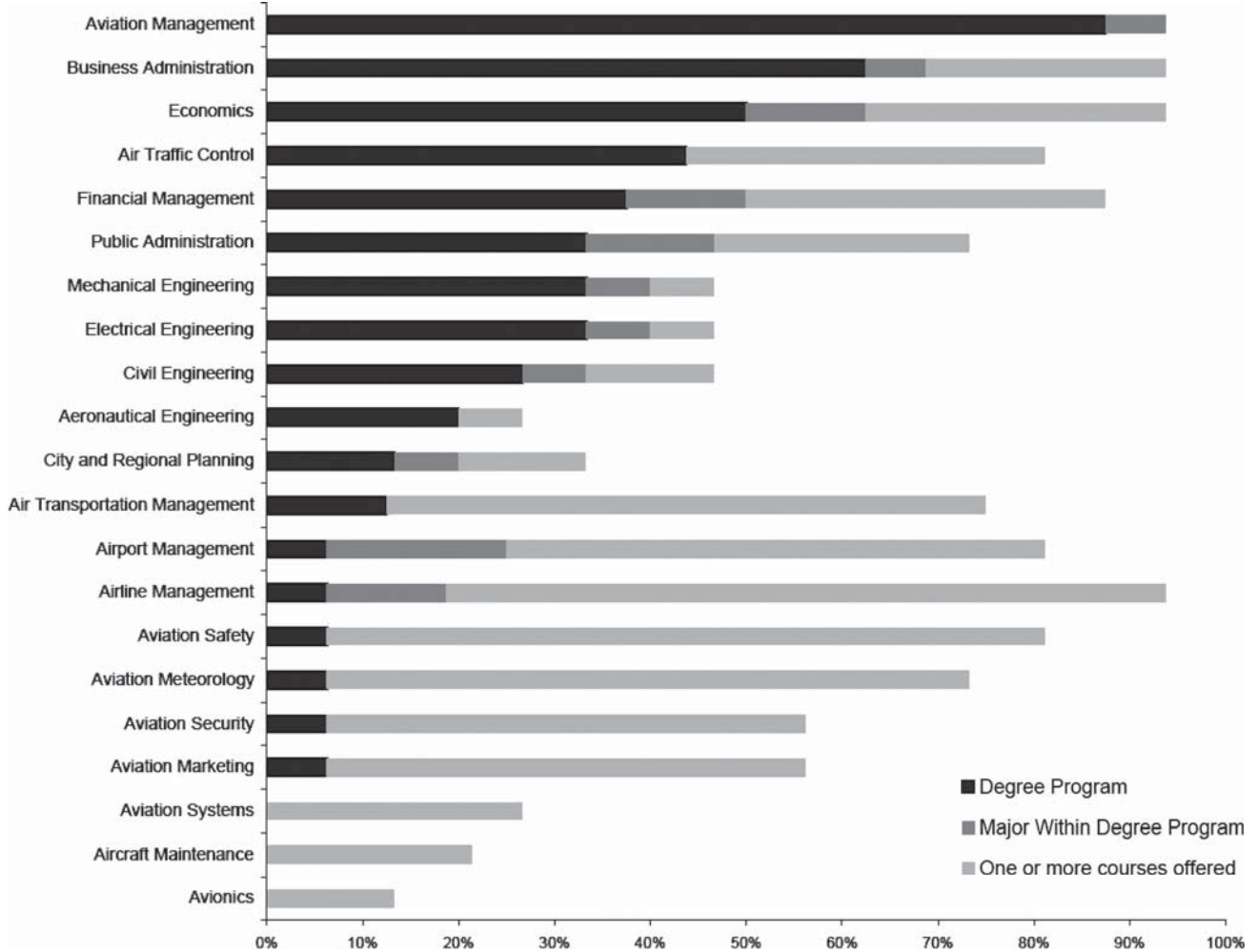
FIGURE 12 Aviation programs offered at UAA institutions (based on a sample of UAA schools).

FIGURE 13 Activities conducted at institutions of higher education often allow for the interaction of aviation professionals and the future aviation industry workforce.

ports and aviation industry companies to address this need. Most such programs involve the local community college and cover basic courses ranging from computer skills to English communications, to some aviation-specific material, from airfield familiarization to aviation law and regulations.

FAA Centers of Excellence

Understanding that the aviation workforce is in need of professionals who can expand the industry's body of knowledge, the FAA has supported a number of universities in developing aviation-related research programs, many of which are directly applicable to the development of the aviation workforce (*20*). Examples of these Centers of Excellence include:

CGAR: The Center of Excellence in General Aviation Research

The mission of CGAR is to make significant contributions toward improvements in the safety and efficiency of general

aviation air transportation. Although much of CGAR focuses on improvements in flight education research, many projects have partnered with industry to have a greater understanding of airport and aviation safety, as well as to test new technologies of benefit to general aviation. CGAR institutions are Embry–Riddle Aeronautical University (Daytona Beach and Prescott campuses), University of Alaska (Fairbanks and Anchorage campuses), University of North Dakota, Wichita State University, Florida A&M University, and Middle Tennessee State University. More information about CGAR may be found at http://www.cgar.org.

NEXTOR: The National Center of Excellence for Aviation Operations Research

The mission of NEXTOR is to advance new ideas and paradigms for aviation operations, train and educate education professionals, and promote knowledge transfer among industry, government, and academic leaders. NEXTOR focuses on performing research to improve the aviation system as a whole and, in doing so, emphasizes the use of strategic and analytical models. Academic graduates of the NEXTOR Center of Excellence have gone on to full-time positions within the airport industry, FAA, and aviation consulting firms. NEXTOR institutions are George Mason University, Massachusetts Institute of Technology, University of California at Berkeley, University of Maryland at College Park, and the Virginia Polytechnic Institute and State University. More information about NEXTOR may be found at http://www.nextor.org.

PARTNER: The Partnership for Air Transportation Noise and Emissions Reduction

The Partnership for AiR Transportation Noise and Emissions Reduction is a leading aviation cooperative research organization and an FAA/NASA/Transport Canada-sponsored Center of Excellence. PARTNER fosters breakthrough technological, operational, policy, and workforce advances for the betterment of mobility, economy, national security, and the environment. PARTNER is based at the Massachusetts Institute of Technology. More information about PARTNER may be found at http://web.mit.edu/aeroastro/partner/index.html.

CEAT: Center of Excellence in Airport Technology

The Center of Excellence for Airport Technology (CEAT) is a research center located at the Department of Civil and Environmental Engineering at the University of Illinois at Urbana–Champaign. CEAT was founded in 1995 as an FAA

FIGURE 14 Workforce development begins long before a future professional's first job.

Center of Excellence focusing on airport pavement issues, and has since broadened to include wildlife issues, anti-icing, and lighting. In 2004, the O'Hare Modernization Program initiated a research program through CEAT that targets technical issues related to construction of new and extended runways at O'Hare International Airport.

One of the major objectives of CEAT is to educate and train students for airport pavement engineering positions with state, federal, and private agencies. CEAT is pleased to have a large group of outstanding students involved in airport pavement research and in wildlife hazard research. It is believed that these students will be well qualified to become professional engineers who will design and construct future airport pavement systems. More information about CEAT may be found at http://www.ceat.uiuc.edu/.

Secondary Schools

There are a select number of high schools in the United States that have a curriculum focused on educating students with interests in aviation and aerospace industry careers. Although these programs tend to focus on areas such as flight training, aircraft maintenance, and airline management, course curricula at these schools do cover aviation fundamentals that are germane to the industry as a whole. In addition, these schools tend to attract those students with both the aptitude and interest in aviation careers (see Figure 14). Examples of these schools include the Aviation Career and Technical Education High School in New York City, New York; Aviation High School in Des Moines, Washington; and Oakland Aviation High School in Oakland, California.

CHAPTER FOUR

INNOVATIVE WORKFORCE DEVELOPMENT PRACTICES

One of the most innovative practices for developing the existing aviation workforce has been to partner with educational institutions. These institutions have the resources and core competencies to provide training and education, particularly in skills that are generic to working in a professional environment, yet important to the aviation industry. Such skills are found in both entry-level and management-level positions. For entry-level positions, skills training in areas such as communications, basic computer skills, writing skills, and English language skills are frequently offered at local colleges. In addition, executive-level management training is commonly offered at universities with graduate or executive-level programs in business administration. Many of these programs cater to the full-time employee, often offering courses at night, on weekends, or increasingly more common, on-line. Providing the resources or establishing a partnership that allows current employees to enhance their skills is of great benefit to both employer and employee.

INTERNSHIP AND APPRENTICESHIP PROGRAMS

Internship and apprenticeship programs are a means of developing the future workforce by offering part-time employment to future members of the workforce. Internship programs are often managed by and in conjunction with secondary- or collegiate-level academic programs. As with most positions of employment, internships and apprenticeships can be competitive in nature. Interns are typically selected after a formal application and interview process. Such a process helps to ensure that the best, brightest, and most motivated individuals are accepted. When managed properly, such programs are found to be well worth their investments.

The AAAE Academic Relations Committee manages the AAAE's airport internship program by maintaining a list of internships and publishing a guidebook for developing internships at airports. Through this committee, the AAAE offers guidance to airports in the development and management of internship programs. The AAAE's *Airport Internship Management Program Guidebook* may be found on the Academic Relations Committee page at the AAAE website: http://www.aaae.org.

Internship programs coordinated with local aviation companies and airports provide a form of training and education not easily replicated in the classroom. Internships may range in duration from several weeks (typically during a summer) to full semester to multi-year programs. Internships may not necessarily be paid positions, although several airports and most private aviation firms do provide a stipend to the interns and sometimes also provide transportation and lodging if the intern does not already have a local residence.

More than half of the airports that engaged in this research did not support a regular internship program, citing the lack of resources to manage such a program as the primary reason. Those that do support internship programs revealed, however, that managing programs are often not as resource-intensive as originally thought, and the return on any investment is often excellent.

INTEGRATED PARTNERSHIPS

The FAA has a number of programs that work with the nation's high schools and colleges to encourage top students to become a productive member of the organization's workforce (*21*). For example:

- The FAA's Technical Operations–Collegiate Training Initiative, formerly known as the Airway Facilities Collegiate Training Initiative hires students from FAA-approved colleges and trade schools for entry-level positions in support of the following jobs:
  – Airway Transportation Systems Specialist
  – Computer Systems Specialist
  – Electronics Engineer
  – Electronics Technician
  – Environmental Protection Specialist
  – Engineering Technician
  – General Engineer.
- The FAA Student Intern Program provides learning and development opportunities and work experience for students in high school, vocational and technical schools, undergraduate programs (both associate and baccalaureate degrees), and graduate programs. This program is open to all students (college, high school, technical, or vocational) enrolled or accepted in a diploma, certificate, or a degree-seeking program (e.g., associate, undergraduate, or graduate).
- The FAA Outstanding Scholar Program hires exemplary college graduates in a variety of areas within the organization, including Health, Safety, and the Environment; Writing and Public Information; Business, Finance, and Management; Personnel, Computer, and Administrative;

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Benefits Review, Tax, and Legal; Law Enforcement and Investigative; and Professional-Related Administrative positions.

AIRPORT AND UNIVERSITY PARTNERSHIPS

More than simply considering universities as a location for recruiting, a number of airports and aviation industry firms have created innovative partnerships for promoting aviation as a career, fostering the future workforce, and developing the current workforce. The following are examples of such partnerships.

Airport University Seattle–Tacoma International Airport

At the Seattle–Tacoma International Airport (Sea–Tac), the Office of Port Jobs "has worked since 1993 to develop strategies, partnerships, and research that benefit job seekers, employers, and incumbent workers in the port-related economy" (*22*). One such effort to meet these goals was the creation of "Airport University," a skill-building and college credit-bearing academic program designed to help the workforce at the airport further develop their careers. Unlike the collegiate-level internship programs, the Airport University provides focus to a skill-based workforce that desires fundamental skill development, ranging from basic academic skills, to technical training, to English communication. These courses were developed from feedback from airport employers seeking to develop certain job skills in their workforce.

Airport University was formed as a partnership between Sea–Tac, Highline Community College, and South Seattle Community College. Class curricula are developed and delivered in partnership with instructors at the college and staff at the airport. Courses are typically offered by community college instructors and some airport employees. Courses are offered on-site at the airport at times that best accommodate the airport workforce, many of whom are on shift-based schedules.

Students enrolled in Airport University courses are either current employees and those seeking employment at the Port of Seattle or any of a number of employers at the airport, including ground service companies, the airlines, the TSA, and concessionaires.

The Airport University offers courses in three broad categories: Job Skills, Academic Courses, and English as a Second Language (ESL).

Credit-bearing classes that have been offered on-site include:

- Beginning Computer Skills (Keyboarding One and Two)
- Using Computers in Business
- Supervision and Leadership
- Human and Labor Relations
- Introduction to Travel and Tourism Careers.

Non-credit classes that have been offered include:

- Preparation for SIDA and Air Operations Area (AOA) Badging—This class was developed and is taught by an ESL instructor. Students are introduced to the vocabulary, concepts, and testing process by means of a touch screen computer.
- Interview Preparation—This 3-day class, which is also taught by the ESL instructor and staff, introduces job seekers to employer expectations, the SIDA/AOA badging process, resume preparation, and job interview skills. On the final day of the class, airport employers with open positions can interview students. Most students receive contingent offers at that time.
- Job Seeking Basics—A shorter job readiness class that is tailored to the airport as a work place.
- Customer Service Skills.
- Preparation for Citizenship.
- Writing Skills for ESL Students.

Many of these courses are delivered with the understanding that for a large percentage of the students enrolled English is not their primary language.

Since its founding in 2003, more than 750 students have enrolled in Airport University courses (see Figure 15). Most students enrolled in one course (although others have enrolled in multiple courses). Approximately 950 person-courses have been completed since 2003. The vast majority of course completions (77%) were in the job skills category, followed by academic courses (21%), and ESL courses (2%). Most of the courses completed were non-credit-bearing courses, focusing on preparing both workers and job seekers for career advancement.

The program has also awarded 109 small scholarships (up to $450) to low-income airport workers. The majority of the awardees have used these scholarships at three local institutions: Highline Community College, South Seattle Community College, and Renton Technical College; however, a small number of the awardees have included airport workers enrolled in four-year institutions, such as the University of Washington and Embry–Riddle Aeronautical University.

Courses at Airport University are offered either tuition-free or with tuition subsidies and scholarships through a combination of funding sources, including local, state, and federal grants; United Way support; and local tuition assistance programs.

Sea–Tac's PortJobs model has been successfully replicated in other major U.S. airports. Denver International Airport, for example, partnered with the city and county of Denver's Division of Workforce Development to establish the Denver Workforce Center at DIA.

FIGURE 15 Participants at Airport University at the Seattle–Tacoma International Airport learn valuable skills as well as academic credits.

PortJobs also assisted the Baltimore/Washington International Airport in establishing a "One-stop Career Center," a partnership between the airport and Ann Arundel Community College. More information about Sea–Tac's airport university may be found at http://www.portjobs.org.

Embry–Riddle Aeronautical University:
The Teaching Airport

A unique partnership between Embry–Riddle Aeronautical University (ERAU), Daytona Beach Campus, and the Daytona Beach International Airport (owned and operated by Volusia County, Florida) has applied the "teaching hospital" model to internship programs. Known as "The Teaching Airport," students at ERAU are able to integrate their course curricula with internship and other part-time employment opportunities at the airport (*23*). As part of this program, students are engaged in their internship opportunities while taking courses on campus, as opposed to the traditional internship program, where students typically dedicate a summer, semester, or academic year to the internship.

The Teaching Airport Internship is a 15-week program offered during the ERAU fall, spring, and summer terms. For seven weeks the intern assists the airport administration in such functions as grant development, budgeting, marketing, air service development, and other strategic initiatives. For the remaining weeks, the intern assists airport operations in performing daily airfield activities, such as conducting airfield and terminal inspections, assisting with aircraft and passenger needs, and performing activities associated with special events and alerts. At the conclusion of the internship, interns create two deliverables: a log of their activities and a technical report on an activity in which they have participated. Such technical reports have ranged from analyses of runway incursion hotspots to vehicle parking behavior to air service analyses. Unique to The Teaching Airport, internship activities at the airport are directly integrated into the student's classroom experience at the university.

In addition to the internship program, The Teaching Airport operates an airport information kiosk at the airport. This kiosk is staffed by ERAU university students and is equipped with a series of computers that display real-time flight tracking of all flights departing and arriving to the airport and local and national real-time weather information. Student "ambassadors" staffing this kiosk gain valuable experience by providing technical information to interested airport visitors (see Figure 16).

Since the inception of The Teaching Airport in 2003 more than 50 student interns and kiosk ambassadors have gained

FIGURE 16 Teaching Airport at Embry–Riddle Aeronautical University has contributed to the development of nearly 100 new aviation professionals through integrated workforce development programs with the Daytona Beach International Airport.

valuable experience in the airport industry. Many of these interns have since gone on to full-time positions at many of the nation's largest airports, aircraft manufacturers, FBOs, and aviation consulting firms (*24*). Specifically, Daytona Beach International Airport has benefited from this program by having direct access to already trained potential members of its workforce and has hired several members of its workforce directly from this program.

The Teaching Airport program has also offered other activities to help educate and train the students. Such activities have included a guest lecture series and the use of the airport as subjects for research activities and site visits. It is estimated that hundreds of students have benefited from The Teaching Airport program since its inception. It has also become evident that many Teaching Airport activities may be emulated at any number of universities, community colleges, or even secondary schools located near a civil use airport. More information about the Embry–Riddle Aeronautical University Teaching Airport Program may be found at http://www.erau.edu/db/teachingairport/.

Ohio State University Department of Aviation: Student Employment Program

The Ohio State University Department of Aviation has a very active student employment program at the university-owned and operated airport. Students have been trained in a wide variety of professional skills to enhance the airport workforce. Student employees are placed in jobs, including aircraft line service, customer service, engineering, planning, and administration (see Figure 17).

Student employees engaged in research and strategic initiatives at the airport have presented their findings to national audiences, which has helped to further develop the oral and written communication skills of the student employees. As a result, students graduating from the Ohio State Airport employment program have gone on to successful careers in aviation consulting, research, and management, as well as line service and other skill professions.

Ohio Aerospace Initiative

In the state of Ohio, there has been a state-wide initiative to grow and foster the state's aviation workforce. Ohio is often known as "The Birthplace of Aviation." In the more than 100 years since the Wright brothers developed the first fixed-wing fully controllable aircraft in Dayton hundreds of companies employing thousands of professionals with interests in aviation have been a significant contributor to the Ohio economy.

To ensure that these companies continue to reside in Ohio, and that the current and future Ohio workforce stays in Ohio, the Ohio Board of Regents has established and promoted the Ohio Aerospace Initiative, a consortium partnering the state's public colleges and universities with Ohio-based companies with interests in aviation (see Figure 18).

The mission of the Initiative is to align university course curricula with the needs of the aviation industry. These colleges include The Ohio State University, Ohio University, Bowling Green State University, Sinclair College, Kent State University, and Columbus State College. Industry partners include NetJets, Limited Brands, and Nationwide Insurance.

As a result of this initiative, The Ohio State University Department of Aviation developed an integrated course in Business Aviation. This course combined traditional textbook study with site visits and term projects in partnership

FIGURE 17 Ohio State University Department of Aviation employs students in a variety of positions, from operations staff to environmental analysts.

FIGURE 18 Ohio Aerospace Initiative is among the first integrated state, university, industry partnerships with a focus on the development of the business aviation workforce.

with local business aviation departments. Students graduating from this course have gained the ability to enter the workforce with valuable experience in the operation of business aviation firms. This curriculum is being shared with all the colleges in the initiative. More information about The Ohio State University Department of Aviation student employment programs and the Ohio Aerospace Initiative may be found at http://aviation.osu.edu.

Industry Advisory Boards

To ensure that they are educating their students to be productive members of the aviation industry workforce, several universities have partnered with industry to form industry advisory boards. These boards are comprised of a panel of typically executive-level representatives from a spectrum of sectors within the industry. Boards range in size of membership from 6 to 20 members.

The primary mission of these boards is to guide its respective colleges and universities in developing and maintaining program curricula that meet the needs of the industry, particularly in the face of a highly volatile environment, with constant changes in policy, technology, and appropriate business methods.

Industry advisory boards are mutually beneficial to all parties. Academic programs with such boards are more able to keep in touch with the needs of the industry, and students within these programs are better prepared to be productive members of the workforce. In addition, those industry members on an advisory board benefit by both influencing the academic institution's curricula, and having direct access to the students studying under these curricula. Examples of universities and colleges with active aviation industry advisory boards include Auburn University, Dubuque University, Embry–Riddle Aeronautical University, Purdue University, Louisiana Tech, and the University of North Dakota.

CHAPTER FIVE

CONCLUSIONS

CONCLUSIONS

The purpose of this synthesis report was to better understand the aviation workforce and the current workforce development practices in the aviation industry, outside of flight crew, airline management, and air traffic management positions. To conduct this synthesis, a combination of a literature-based review and discussions with key organizations within various sectors of the aviation industry and institutions of higher education were performed.

There are both issues and solutions that exist when it comes to meeting the workforce development needs of the aviation industry. Issues revealed as part of this study include:

- There is little specific data regarding the number and types of jobs that exist in the aviation industry, outside of flight crew and air traffic management positions.
- Recruiting and hiring of the aviation workforce is generally done through open job announcements, despite the fact that jobs within the industry often require very specific education and training. As a result, a significant number of the aviation workforce enters the industry with little aviation-specific education or experience.
- Aviation industry organizations, including airports and ground service providers, do engage in various levels of workforce development. Such programs are often conducted in-house and tend to focus on entry-level training; further development efforts, particularly for management training, when performed in-house are often ad-hoc in nature.
- Workforce development in the aviation industry is focused on individual training and less on the organizational and systematic components of a comprehensive workforce development program.
- There are a number of professional organizations that have developed training and certification programs for the purpose of developing the existing aviation workforce and there are a number of institutions of higher education that have developed curricula to educate the future aviation workforce.
- There are a number of innovative practices, programs, and activities that leverage the resources of aviation industries and higher education institutions that may optimize the industry's workforce development strategies.

This study has revealed that the use of internships and other programs that partner industry with institutions of higher education may be one of the most productive methods of workforce development. However, it was also revealed that a significant portion of the industry does not participate in such programs, and moreover, may be hesitant to embark on such efforts. The reason for this may be that industry organizations may be unfamiliar with the process of establishing, managing, and assessing the effectiveness of internship programs, and thus have difficulty justifying the effort.

An ancillary but important result of the queries and interviews conducted for this study was the expression of fiscal concern when it comes to workforce development programs. Many airports and small aviation industry organizations have limited resources to dedicate to areas outside of their core business functions. Many interviewees expressed their desire to invest in formal workforce development programs but have difficulties receiving budgetary approval to do so. This is particularly true in the public sector, including primarily small general aviation airports owned and operated by smaller municipalities with limited funds.

FURTHER RESEARCH

There is a clear need to have a better understanding of the aviation industry workforce. While the industry has detailed data on the number of registered pilots, the number of airport operations staff, for example, is far less explicitly known. This necessary information could be developed through a comprehensive survey of the aviation industry workforce. This study would include an inventory of aviation jobs at the nation's airports, the aviation support industries, aviation planning, engineering, and consulting firms, and state and federal agencies. A study of the wide variety of organizational structures that exist within these organizations might also be included.

In addition to learning more about the current inventory of the aviation workforce, an understanding of how professionals in the industry advance through their careers is needed. A professional ethnographic study may reveal the most successful career pathways for members of the aviation workforce.

Once such an inventory is completed, future research may consider the goal of developing comprehensive workforce development programs for the aviation industry that consider more than simply employee training, including comprehensive programs from an institutional level.

Such research may study:

- Formalizing and standardizing performance assessment methods,
- Analyzing organizational structures to determine the best environments for the workforce to perform,
- Developing formal and consistent funding mechanisms to support continuous and comprehensive workforce development programs (in part by researching existing funded programs at agencies such as the U.S. Department of Labor and Education), and
- Creating bridge programs among airports, private industry, and government agencies. Such programs would advance the practice of workforce development in the industry to a cross-institutional level.

It would be useful to study the need for a guidebook for assisting airports and other aviation industry organizations on the concept of workforce development planning. This might include: how to recruit talent, how to nurture and train incoming talent, best practices for organizational efficiency, the practice of continuing education, best practices for retaining the industry's best and brightest, and succession planning.

Performing an analysis on the best practices of internship programs in the industry may lead to the development of a separate guidebook on creating and management internship programs. Furthermore, this research could lead to the development of cross-institutional intern and rotational programs.

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APPENDIX A

UAA Member Institutions of Higher Education

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Abbreviations used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation